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VIEWS, NEWS AND INTERVIEWS.

"I heard the other day," said a traveling salesman for an electrical manufacturing firm, "that a lighting company had been incorporated up the State, that work on the station had commenced and that the company was in the market for apparatus. I got on a train and traveled as far as I could and then hired a team to drive the rest of the way, 10 miles, over a muddy, slushy road. I inquired for the president of the company, found his residence and was directed to a field where they said he could be found. When I got there I saw the president laying up bricks for the smokestack, the treasurer of the company carrying mortar for the president and the secretary shingling the roof. They all stopped work when I offered them cigars, and the president was surprised when he found I didn't deal in second-hand boilers, engines, dynamos and belting."

Two Connecticut telegraph linemen recently discovered a "cross" that was of rather an unusual kind. It was found that a spider had spun a strong web between two wires, and that the dew and rain held by the web made a "cross" of substantial magnitude.

Henry Guy Carleton, the well-known playwright, is an old telegraph operator and still maintains his interest in electrical matters. He is afflicted with an impediment in his speech, which, however, doesn't make him sad. The other day he called at an electrician's shop in New York to see the proprietor. The boy in charge said the proprietor was out.

"Wh-what's his n-n-name?" asked Carleton.

"Henry E. Stammers."

"S-s-so do I," laughed Carleton, as he left the shop.

The steamship "Faraday" arrived at Halifax, N. S., on May 1 with 500 miles of the Commercial Cable Company's new cable on board, which, as soon as the weather and the bergs and floes of ice in the North Atlantic permit, she will lay from the company's station at Canso, Nova Scotia, to the eastern side of the banks of Newfoundland. The "Faraday" made the passage from Ireland to Halifax in 11 days. The cable on board is in perfect condition.

One of the features of interest in the Antwerp Exhibition will be a number of exhibits illustrating the history and progress of the various forms of artificial illumination. All kinds of lights, from the early Pompeian and Roman lamps down to the most modern forms of electric lamps, will be represented.

In his last published work, Professor Yarchanoff, of St. Petersburg, gives the results of his researches with the electric currents of the skin. As stated, these experiments led him to connect the skin of various parts of the body by means of non-polarizable clay electrodes with Meissner's galvanometer, and at such times the various stimuli of the skin, such as light tickling with a brush, heat, cold, a needle prick, sound, light, taste and smell were noticed, and in all these cases a strong deflection of the galvanometer needle was observed. Merely opening the eyes, after they had been closed for some time, produced a considerable deflection; and mental efforts, like calculation, also had a similar effect. These currents, if they exist, it is remarked, must pass off with the moistened deposits which are being constantly expelled, and a new supply of electricity would have to be found somewhere, and such electricity, says Professor Yarchanoff, having its source perhaps in the decomposition of metals, taken in the food we eat and the air we breathe, must, of necessity, entail upon the organism a continuous strain in its production—it being from such causes, perhaps, that the body becomes fatigued after a comparatively few hours of exertion, and absolute rest becomes necessary for recuperation.

THE UNION RAILWAY COMPANY'S OVERHEAD TROLLEY LINE ON 135TH STREET, NEW YORK CITY.

May 1 was the fiftieth anniversary of the sending of the first telegraphic news dispatch in this country. It was sent from Washington to Annapolis, a distance of 22 miles, under the supervision of Professor Morse. The dispatch conveyed the news of the adjournment of the Whig Convention at Washington late on the afternoon of May 1, 1844, and announced the names of the Presidential and Vice-Presidential candidates nominated, Clay and Frelinghuysen.

The advertising agent for a large cigarette company is traveling through the West with a search light giving exhibitions.

THE OVERHEAD TROLLEY IN NEW YORK CITY.

COMPLETION OF THE ONE HUNDRED AND THIRTY-FIFTH STREET LINE.

The illustration on this page shows a portion of the handsome overhead trolley construction on 135th street, New York city, which has just been completed by Neftel, O'Connor & Company, for the Union Railway Company. It is the first road on the overhead trolley system in New York city, and is as fine an example of overhead work as may be seen. The poles, furnished by the Union Railway Company, are embedded in crushed stone and cement to a depth of six feet six inches, and are absolutely in line. The trolley wires and the No. 0000 feeder cable are drawn as taut as harpstrings. The poles are set 125 feet apart and as the street is a wide one, the center pole construction presents quite an ornamental appearance. The rails are 80 pound girder, bonded with flat copper strips with rivets at each end, which are driven through holes in the rails and then headed up. The curve construction on the line is very light and graceful.

The center poles are used only on 135th street from Eighth avenue to Madison avenue, where side pole construction prevails over the remainder of the line up Madison avenue, over the bridge across the Harlem and through 138th street to the main line of the Union Railway Company. The line is practically finished and a trial trip was made during the night of April 30. Regular service will soon be inaugurated.

The progress of the Union Railway Company in building this line, which is about a mile and a quarter in length, has been noted from time to time in the ELECTRICAL REVIEW. The opposition of property owners along 135th street was very bitter against the trolley at first, but when it was persistently rumored that the Manhattan Railway Company contemplated building an elevated road through the street, the opposition vanished as suddenly as it came.

The value of this connecting line to the traveling public can hardly be overestimated. It is a genuine boon to suburban residents north of the Harlem River. When the present plans of the Union Railway Company are completed one may take an express train on the Ninth avenue elevated downtown, ride to 135th street, change to the trolley line and go to Mount Morris Park or Travers Island in considerably less time than is now required and with but one change of cars.

It is not known that any more overhead trolley lines will be built in New York, but it is pretty certain that a number of underground conduit roads will be built in the near future. The failure of the New York State Railroad Commissioners to obtain legal power to act as judges to award the Metropolitan Traction Company's $50,000 prize for an underground conduit system has led that company to adopt other tactics. President John D. Crimmins said in an interview last week:

"We employed the most expert engineers and set them at work to bring out all that was best in the way of an underground trolley system. We began a series of important conferences with several of the large electrical companies. Construction as well as electrical engineers were employed, and the former recommended almost the same system of construction for the underground trolley as for a cable, with a conduit 14½ inches wide by 27 inches deep.

"As a result of our conferences, two of the big electrical companies made us offers, in which they express their willingness to equip our roads with the electrical machinery necessary to run our cars by the underground trolley system free of all cost to us. The conditions are that having been allowed to do this, and failing at the end of a year to show that the underground trolley is a success as a motive power, and also to establish that by its use the traffic of the road can be conducted at a certain cost per mile, they must take out their apparatus at their own expense.

"What the cost per mile of operating the road which has been discussed is, I would rather not say just now. But if they fulfill the conditions placed upon them we are to buy their equipment outright at a sum fixed upon between us."

Mr. Crimmins said that one of the companies which had made an offer to equip with electric machinery any of the lines of the Metropolitan Traction Company had been running with success for several years an underground trolley line in Budapest. This was equivalent to an admission that one of the companies from whom the Metropolitan Traction Company has had offers is Siemens & Halske, as it is well known they have operated the road referred to since 1889. Mr. Crimmins would not intimate with which of the companies the Metropolitan Traction Company would close a contract, and said that everything so far was only in the way of discussion. Mr. Crimmins thought the first underground trolley would be laid along Lenox avenue, but could not say how soon.

The Age Coating of Incandescent Lamps.

BY PROF. ELIHU THOMSON.

As a part of the discussion of Prof. William A. Anthony's paper on the "Effect of Heavy Cases in the Chamber of an Incandescent Lamp," read before the American Institute of Electrical Engineers, the following communication from Prof. Elihu Thomson was received:

The facts and reasoning put forward in Professor Anthony's paper are the more interesting to me, as his conclusion as to the cause of blackening of bulbs or "age coating," agrees with my own view of the matter, a view which I have had for several years, and which I brought out last year in a paper on the "Life of Incandescent Lamps" in the *Lehigh Quarterly* (Lehigh University). It has been known for a long time past that the very highest vacuum was not so beneficial to the life of lamps as a more moderate exhaustion; and Mr. Edison patented the use of a residual chlorine atmosphere in about 1883. A residual bromine or iodine vapor would appear to be possibly better than chlorine, but in the same line of work, and owing to the close chemical relations of the three elements, any effect obtainable with one might be expected to be obtained in a greater or less degree from the substitution of another, or even the substitution of two others together in the bulb. A mixed bromine and iodine vapor may give even better results, or a mixed chlorine and bromine or iodine. After all, the merit of such admixtures, or even of the use of a diluent like bromine, may require some further experience to settle. It is a well known fact that incandescent lamps starting with a rather low vacuum, often improve their vacuum automatically during the run. My opinion as to the cause of this improvement has long been, that the first beginning of the production of soot or separation of solid carbon at normal potentials, causes, by the separated carbon particles, absorption of the residual gas so as to improve the vacuum. Fine carbon has, as is known, a powerful gas absorbing tendency, and although the amount formed may be so slight as to be totally imperceptible in the bulb, it may still be present in sufficient quantity to have the effect noted.

The bearing of these facts on the sustained brilliancy of a lamp started with a lower vacuum is evident. If the gas present be gradually taken up, the efficiency of light production will rise and compensate for the change in the filament as the time goes by.

I agree with Professor Anthony, and my views were brought out in the paper above referred to, that the age coating is more evidently due to simple vaporization of carbon, than to the many causes which have been assumed for it. I quite agree with him that the carbon leaving the filament is vaporous, but I think it must condense at once just outside the filament, and not pass out into the bulb as vapor in ordinary cases. I have a 25 volt incandescent lamp in my possession which was accidently connected for a moment to alternating mains of large carrying capacity of 1,000 volts potential difference. The lamp actually survived the shock, and is in good condition with one exception. While the bulb glass is perfectly clean and clear, there exists a flocculent mass of soot which is coherent and falls about within the lamp. It is a comparatively large mass, and at first surrounded the filament as a delicate mantle, evidently formed by a dense evolution of carbon vapor condensing immediately around the carbon in the vacuous space. Here the age coating (?) was too dense to reach the sides of the bulb. The lamp, however, is a significant example of the normal action of vaporization highly intensified. The filament retains its steely lustre.

Contrary to the statement of the paper that no shadow on the bulb is ever formed, except from the metal vapor, I am confident that I have seen it in series lamps when the carbon broke, and in cases of as sudden evolution of carbon vapor as of the metal vapor from the supporting wires. In a good vacuum, the carbon vapor condensing would give particles which would move in rectilinear paths as the metallic vapors. The shadow effect is dependent on a local evolution of vapor, with a part of the wire or filament between the point of evolution (as the joint) and the opposite glass surface. It would not be expected where the evolution of carbon vapor is nearly uniform from all parts of the carbon filament as in the normal wear of the carbon. I am also confident that I have seen platinum shadows, where only platinum and no copper was present with the carbon.

As bearing on the statement of the paper that the carrying of a current through a gas seems to be an electrolytic action, and, confirming the same, I may say that I have a lamp which has copper terminals in the bulb, and which shows, attached to the copper wires, fine hair-like or leaf-like projections, evidently produced by current passing the vacuous space between the wires and carrying copper, the development resembling lead and other metallic trees formed by electrolysis of solutions. Lamps have been known to short-circuit from this cause.

I, at one time, experimented on arcs formed between metal electrodes in a highly vacuous chamber, and found that it was easy to coat objects with metallic shining mirrors—silver giving a very bright coating. With a large current the effect is instantaneous.

The paper states that, "The fact that carbon cannot be melted, or even softened, at any temperature we can produce, has been adduced as proof that it cannot be vaporized." This is not strictly a correct statement. Carbon can readily be softened and bent at temperatures approaching that of the positive crater of an arc lamp, as I have proved conclusively. I have some bent sticks in my possession made from straight sticks of five-sixteenth carbon. The carbon in the crater of a large arc is always soft and putty-like. As a matter of opinion, I think that carbon will readily melt when subjected to the highest incandescence surrounded by inert gas at very high pressure. I am not aware that the experiment has yet been tried under extreme conditions.

I think no one now doubts that the arc stream, or flame between the carbons of an arc lamp, is due to carbon vapor and not to carbon particles evolved from the crater surface.

I am glad that Professor Anthony has put forward in such a clear and comprehensive manner the arguments showing that slow evaporation of solid carbon is the true cause of lamp bulb blackening. How often it is that complicated theories are put forward to account for simple facts, when at last it may be found that such theories were never needed. Little further proof is needed to establish the fact that simple evaporation at the high temperature amply accounts for wear of carbon in incandescent lamps, and for crater emanation in arcs.

An Electrical Man's Views of Woman's Suffrage.

TO THE EDITOR OF ELECTRICAL REVIEW:

If ever the perennial question of woman's suffrage is settled affirmatively, the atmosphere of voting places will doubtless be charged, if not sir-charged, with electricity of the liveliest sort. "Resistance" will be useless, and "alternating currents" will be of "high (old) frequency"; and, alas! how different will "sparking" become!

Apropos of this opinion, is the following fragment from the "Proceedings" of the mock session of the Massachusetts Legislature of 1879, where views were expressed "between the acts" of prorogation, which would hardly have been tolerated in the more dignified sittings of the cod-fish Solons:

A MAN'S VIEWS ON WOMAN'S SUFFRAGE.

What a terrible sight to behold! what a story of woe must be told! what a chance for the men folks to scold! when women can vote. Then infants must prattle alone, or be left with their sisters half-grown, while motherly ballots are thrown where women do vote. Then ladies shall orators turn, and the wires of politics learn, leaving bread in the ovens to burn, while women shall vote. If the fashions continue to be as foolish as those that we see, 'twill be horrid, you all must agree, when women can vote. For the dresses, if made with a train, shall be gracefully gathered in vain, as excitement will drop them again, when women shall vote. Then will follow terrific abuse of the men whose promiscuous use of tobacco stains dresses with juice, where women shall vote. When the ladies outnumber the men in ratio of 20 to 10: Oh, what will become of us then, if women can vote? It will seem like between and betwixt, and matters be awfully mixed; Ah! I'll tell you how things will be fixed, when women can vote. Mrs. Kearney—the bold—will be there, and, though too enlightened to swear, she will say, "now I vum" or "declare" bloated men shall not vote! And, of course, to pay the old score, they will order us out at the door, and men shall be voters no more—only women shall vote! Then will husbands stay meekly at home, while the ladies in dignity roam round the building where glistens the dome—over women who vote! Oh! away with such nonsense as that! life would be a continuous spat; you would never know what you were at, if women should vote.

Brooklyn, April 23. J. C. C.

Erastus Wiman's Scheme for Staten Island.

Erastus Wiman was in Albany, N. Y., last week and had a five minute interview with Governor Flower on the Hobbie bill, amending the railroad law so as to give electric light and power companies the right to build electric railways not exceeding 20 miles in length and not more than four miles in a city, and to purchase and sell land not exceeding 2,000 acres. A bill of this kind was vetoed last year, but this year the Hobbie bill was amended so as to meet the Governor's objections, and Mr. Wiman believes the Governor will sign it. The personal object of Mr. Wiman is to develop the back hill country of Staten Island, and he thinks this can only be done by allowing the electric light and power companies to both build railroads and own land as a land improvement company, and thus unite harmoniously in the development of a particular section.

The *Popular Science Monthly* for May contains an article on "Peculiar Sound Effects," by Mr. A. A. Knudson, who is well known in the electrical field.

ELECTRIC LIGHTING PLANT OF THE "PRISCILLA."

A FINE INSTALLATION ON THE NEW FALL RIVER BOAT.

The new Fall River Line boat "Priscilla," which is now receiving her finishing touches at the Fletcher Iron Works in Hoboken, N. J., will undoubtedly be the handsomest and best equipped as well as the largest ship of her class in the world. She will run between Boston and New York, and it is expected that her first voyage will be made on May 10. She is a little larger and finer than her sister ships, the "Puritan" and the "Pilgrim," and being the newest of the three, naturally has many modern improvements which the other two lack.

Among these is a dynamo room separate and distinct from the regular engine room. This dynamo room is in the forward part of the ship between decks, and allows plenty of space for the proper handling of the plant. The equipment, which was installed complete by the General Electric Company under the supervision of District Engineer Whitmore, consists of three 50 kilowatt direct current direct-connected General Electric dynamos and "Ideal" engines with outboard bearings and 11x12 cylinders. There are about 65,000 feet of wire of all kinds in the ship, approximating about seven tons in weight. All the wire larger than No. 6 B. & S. is stranded and most of the larger sizes are lead covered. The circuits are all metallic return, the hull of the ship not being used as a part of the circuit. The wire was all made by the General Electric company, and is a special white core marine wire practically conforming to the United States government's standard specifications.

The switchboard is of marble, mounted on a handsome mahogany frame. The instruments and rheostat switches are mounted directly on the board without extra bases. Weston ammeters and voltmeters, the astatic type, finished with a copper finish, are used. The dynamos are connected to run in multiple. There are five feeders all running to the main deck, four going up through and feeding into the system on the saloon deck. The fifth runs along the main deck and down between decks to a center of distribution under the main dining room. There are three circulating mains, one on each deck, connected by four risers or vertical mains.

The lights are so divided that not more than five or six amperes are supplied by one circuit. Cabinets are located in passageways on the gallery and saloon decks and other convenient places in which panel boards are placed, these being fed from the circulating mains. At the end of each feeder is placed a large center of distribution panel board or cut-out so arranged that the circulating main on each deck is divided into four parts. The panel boards used are of special design with Hutchins-Herrick fuse blocks mounted on marble. The large center of distribution panel boards and the panel boards for the distributing circuits are placed in mahogany cabinets with beveled glass fronts.

There are no heavy electroliers employed, the dome lights in the main saloon being arranged in the ceiling. There are, besides, fixtures on all the masts and fixtures in the dome. The installation furnishes current for a total of about 2,000 lights. The staterooms generally have one light each and the bridal chambers have two. The President's room has 12 lights with two more in the adjoining bath room.

The whole plant is of excellent design and splendid construction and is probably the finest marine plant of its size ever installed by the General Electric Company.

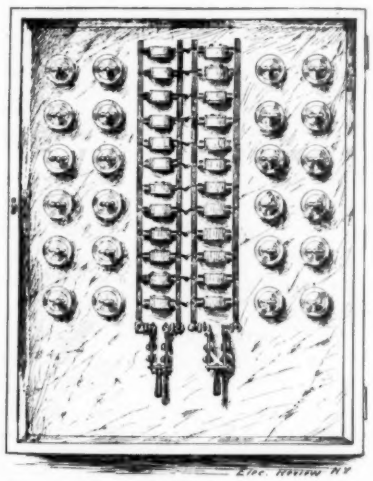

FIG. 1.—ONE OF THE PANEL BOARDS ON THE "PRISCILLA."

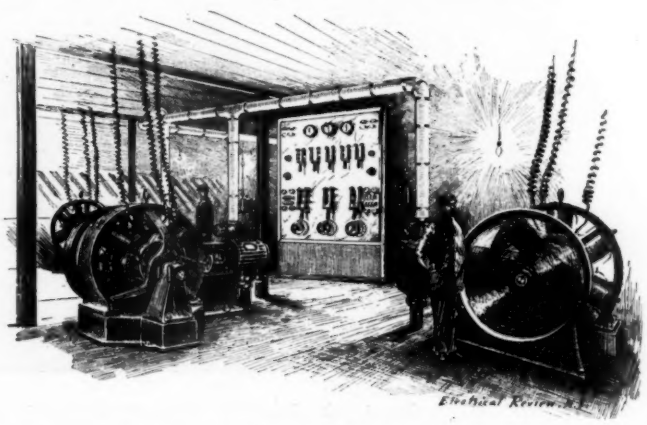

FIG. 2.—INTERIOR VIEW OF THE DYNAMO ROOM ON THE NEW FALL RIVER BOAT "PRISCILLA."

National School of Electricity.

The Associated Press sent out from Chicago on May 5 the following dispatch:

Final charter papers have just been granted at Springfield to the National School of Electricity, an organization growing out of the electrical department of the World's Fair. Professor Barrett, chief of the electrical department of the World's Fair and chief electrician at Chicago, is at the head of the organization, and Mr. Thomas A. Edison heads the faculty of education.

The faculty is made up as follows: Mr. Edison, dean; Mr. Nikola Tesla, Dr. Gray, of Highland Park; Professor Carhart, of Ann Arbor; Professor Anthony, of New Jersey; Professor Ryan, of Cornell; Professor Perrine, of Stanford University; Professor Shepardson, University of Minnesota; Professor Thom, University of Ohio; Professor Jackson, University of Wisconsin; Professor Ayres, University of Louisiana; Professor O'Dea, University of Notre Dame, and Professor Barrett.

It is the intention of the founders of the school to inaugurate classes in electricity in every city and town where the population will justify it.

An Important Decision on Electric Railway Patents.

Judge William K. Townsend, of the United States Circuit Court at New Haven, Conn., on May 3 handed down his decision in the case of the General Electric Company of the United States against the Jamaica and Brooklyn Railroad Company.

The decision is on a bill in equity alleging infringements of patent granted to Stephen D. Field July 16, 1889, for a trolley system for an electric railroad. The defense is a denial of infringement, anticipation by prior patents, publications in prior inventions, insufficient description and specification, want of patentable novelty and abandonment.

Judge Townsend says the complainant admits that every element in the invention existed in art before the combination was made, and further he finds there was a question in the Patent Office in 1877 whether a patent could be granted to Field because of a prior patent known as the Clark, which embodied the same principle. In summing up the judge says the defendent in this case is the Jamaica and Brooklyn Railway Company, but it appears by the record that it is a customer of the Edison Electric Company and the latter company is defending this suit. The General Electric Company was organized May 15, 1883, for the purpose of developing the inventions of Stephen D. Field and Thomas Edison. The Edison interest eventually separated from the Field interest, the latter being unsuccessful in the Patent Office, and the dissolution was agreed upon by both sides.

Even if the parties who represented the Edison interest were, said the judge, actuated in this proceeding by dishonorable motives — endeavoring te get rid of a bad bargain—this does not effect their standing in the case provided they committed no wrongful act. By abandonment of said proceedings and the execution of agreement the Field interest elected to protect their rights by dissolution of previously existing corporate relations, and they cannot now go behind said agreement. It is clear that the ownership of patent by corporation refers no right to its individual stockholders to use the patent. Decree entered dismissing the bill.

The Buckeye Electric Company Wins Again.

Judge Ricks has for the second time delivered an opinion refusing the Edison Electric Light Company's application for an injunction against the Buckeye Electric Company, of Cleveland, O., makers of the "Buckeye" incandescent lamp.

Judge Ricks' decision, which is quite lengthy, concludes as follows:

In this hearing it ought affirmatively to appear that these parties who claim a prior equity to the defendants, were ignorant of and did not participate in or authorize the several acts and the line of contact which it has been held estopped the other plaintiffs from claiming relief against these defendants. This should appear so satisfactory as to justify the court in granting this unusual relief. The burden is not on the defendant to show that this injunction should not issue, but it is on the plaintiffs, who claim a prior and superior equity not affected by the estoppel heretofore found to preclude their associate plaintiffs to show that it should issue, and this must be shown by the required degree of certainty. I do not think this has been done.

In 1892 the plaintiffs, who now joined in this suit, instituted a suit upon this same patent against the Sawyer-Man Electric Company. This was at a time when the certificate of correction was still supposed to be in force, and was a ratification of that correction so far as the licenses were concerned. They then believed the proceedings for correction had been valid and effective, and accepted and adopted the beneficent results they supposed followed.

But it has been suggested, in as much as the complainants cannot appeal from an order refusing an injunction, while the defendants can appeal from an order allowing one, that the court allowed a preliminary injunction, but suspend its operation pending appellate proceedings. By such an order it is urged the plaintiffs may have partial relief, and no great hardship be imposed upon the defendants. I would be very glad indeed to have such an agreement made so that this case might be speedily reviewed.

I fully appreciate the disadvantages under which the plaintiffs stand, because of the peculiar situation of these litigants, but I have no right to impose upon the defendants the burden and expense of prosecuting an appeal from an order allowing an injunction to which I have found the plaintiffs are not entitled. Such an order might properly be made where the parties assent, or there might be such a condition of proof, and such peculiar circumstances present themselves in a case as would warrant the court in making such an order as plaintiffs suggest. The discretion exercised by courts in acting upon motions for injunctions is very great, and each case must be decided upon the facts and circumstances present; and a proper one might arise for such a departure from the ordinary practice, but I do not find this to be such a case.

The motion for a preliminary injunction is, therefore, refused.

Manager A. J. Clark, of the Sunset Telephone and Telegraph Company, recently returned from Skagit county, Wash., where he has been arranging for the extension of the long-distance lines to the principal towns of that section.

OUR BOSTON LETTER.

Mr. L. C. Whitney, of the Connecticut Royal Arc Company, is making a short stay in Boston, keeping one eye on the lamps he has already installed and both eyes on prospective orders. Mr. Whitney reports business very good with his company, and that the economical features of the Royal arc lamps are bringing them into general favor with the central stations. When it is considered that the average life of the positive carbon under this system is prolonged to 60 hours, and that the negative carbon has been known to burn 300 hours without any apparent signs of disintegration, this fact is not to be wondered at.

The latest aspirant for favor in the incandescent lighting field is the "Century" lamp, which has just been put on the market by the Campbell Electrical Supply Company of this city. The lamp is a beauty in all respects, and will undoubtedly maintain the high standard with which the trade have become familiar in all goods bearing that brand. The "Century" lamp is made in all sizes from eight to 100 candle-power and for all voltages, and is guaranteed to be equal in all respects to the best in the market. In addition to the regular line of plain and colored lamps, they are made with anchored filaments and also with special coiled filaments for railway use. In general appearance the lamp is very neat and attractive, and those who have already seen and used them speak of them in the highest terms.

The power house of the Interstate Electric Road at Attleboro, Mass., which was destroyed by fire about the first of the year, has been rebuilt, and is now almost ready to resume business. As the street lighting is also done from this station, and the town has been without lights since it was burned, the citizens are naturally eager for its completion. They have had quite enough of the pains of darkness.

Hon. Aretas Blood and F. P. Carpenter, of Manchester, N. H., have just returned from Columbia, S. C., where they went to attend the formal opening of the big mill of the Columbia Water Power Company, of which Mr. Blood is president. The mill is 400 feet long and will have a capacity of 50,000 looms. It will be used in the manufacture of duck and sail-cloth from 14 to 126 inches in width, and will be operated entirely by electric power, being the first mill in the country to adopt electricity exclusively.

The Boston board of aldermen, at a recent meeting, ordered the Boston Electric Light Company and the Western Union Telegraph Company to remove all their overhead wires through the business section of the city before the 15th of next November. The limit may be extended from time to time by the approval of the board of aldermen and the mayor, and undoubtedly will be, as both companies claim it is impossible to carry out the order.

The much talked of bill for the municipal ownership of conduits for underground wires came up before the house on the 3d instant and, after a lengthy debate, was rejected by a vote of 73 to 61. Mr. Myers, of Cambridge, the author of the bill, and who has made strenuous efforts for its passage, explained at considerable length the provisions of the bill, and upon its rejection, gave notice of his intention to ask for a reconsideration. The concensus of opinion, however, is strongly against the bill, and it is extremely improbable that any different action will be taken. The telephone men have pretty thoroughly demonstrated the utter impracticability of the plan as applied to the city of Boston, and it is more than likely that the majority of business men throughout the State would agree with them, in thinking it unwise to burden the municipalities with an undertaking they know little or nothing about, and in most cases are incompetent to handle in a proper and efficient manner. The New England Telephone Company have already expended over $1,000,000 in underground work, and intend to put their entire system underground as fast as possible, and from their knowledge of the requirements of the work, and the probable extension of their service, are better fitted to look ahead and provide for future demands than any one else would be to do it for them. The same principle will apply to other lines of electrical construction fully as well, and the work would be done in a better and more substantial manner by them than would be possible under municipal ownership.

Mr. Edward E. Cary, of the Beacon Vacuum Pump and Electrical Company, and one of the inventors of the "New Beacon Lamp," delivered a very interesting lecture a few days ago before the senior class of the Institute of Technology on the "Practical Manufacture of the Incandescent Lamp." Mr. Cary went into the subject deeply and handled it in a most thorough manner, and it was received by his auditors with unusual interest, from the fact that it was the first insight they had been able to obtain, from a wholly practical standpoint. Theoretically, the students are, of course, well informed, but as the manufacture of lamps has always been more or less of a secret nature, very little of the actual processes are known. Mr. Cary pointed out the vast improvements made during the past decade, and showed the marked development in the art of filament making, and also in the methods of exhaustion. He also offered the class an opportunity of going over the factory of the Beacon company and watching the lamps under construction in the various departments. It is needless to say that his invitation was promptly accepted, and the students will avail themselves of this privilege at the earliest opportunity.

Boston May 5. H. G. T.

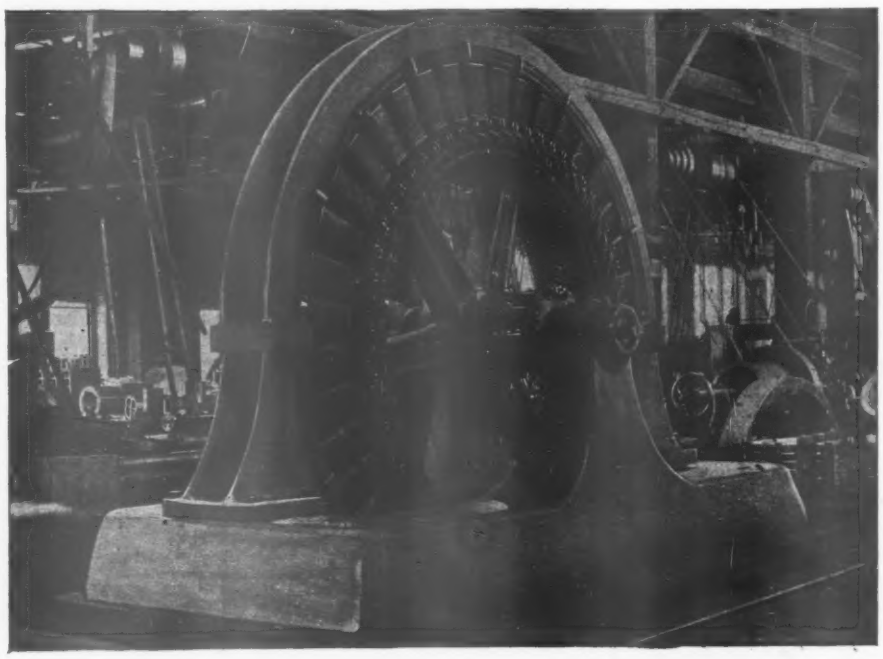

FIG. 1.—500 KILOWATT TRIPHASE GENERATOR AT COLUMBIA, S. C.

Injuries to Pipes in Paris Caused by Electrolysis.

It is well known that in Paris the soil through which gas pipes pass is largely composed of calcareous matter and sulphates. Whenever current leaks from electric conductors to neighboring pipe systems, it must traverse the intervening soil, producing in it electrolytic decomposition. In fact, the prevailing conditions are alike to an electrolytic bath—the gas pipe constituting one electrode, the cable the other, and the electrolyte the layer of earth saturated with water which is frequently acid. Experience shows the correctness of this view. By an examination of injuries to pipes, caused by electrolysis, it is found that the temperature of the surrounding ground has been raised, and that the surface of the gas pipes as well as the lead sheathing of electrical cables is electrified. In calcareous earth the lead pipe for a certain length near the perforation is covered with a pulverulent layer of carbonate and hydrate with an admixture of lead oxide. The formation of carbonate and oxide causes a gradual thinning of the metal, and at last the destruction of the pipe. In sulphated soil, on account of the greater chemical activity of the acid, the perforations are much more pronounced and formed like a crater whose outer walls are covered with a brown powder of sulphur and sulphate of lead. The electrical action on iron pipes produces holes covered with a greenish mixture of both ferrous and ferric sulphate and hydrate and ferric oxide together with some particles of tar. To such action was due the accident in the Rue Notre Dame de Lorette, where three explosions took place during the night of June 15, 1892. The immediate examination revealed the fact that the neighboring gas pipes were all perforated. The escaping gas flowing through the Edison tile conduits reached a manhole where the explosion took place. Since that time the Edison company has buried its cables in solid concrete. After these accidents in the Rue Cafè Larue, April 16, 1891, the Minister of Commerce, M. Alphand, instituted a commission to work out rules governing the laying of subterranean pipe systems, and these regulations became law by an order of the Prefect of Paris, July 31, 1891.

Article 3 of these regulations absolutely prohibits the placing together in one manhole of electric conductors, gas and water pipes and pipes serving for the distribution of compressed air; also the placing in the same manhole of cables belonging to different companies.

Both gas and water companies are obliged to test their pipes once each year, and all companies which use underground pipes in Paris have been placed under the supervision of the engineers of the municipal service.

The Consolidated Street Railway Company, of Worcester Mass., has contracted with the Worcester Construction Company, of which Chas. O. Richardson is manager, for the outdoor work which is to be done this season.

Electrical Power Transmission at Columbia Mills, Columbia, S. C.

On Tuesday, April 24, 1894, was started in Columbia, S. C., a power transmission plant of exceptional interest, in the development of a new and important field in the application of electric motors in the manufacture of textiles.

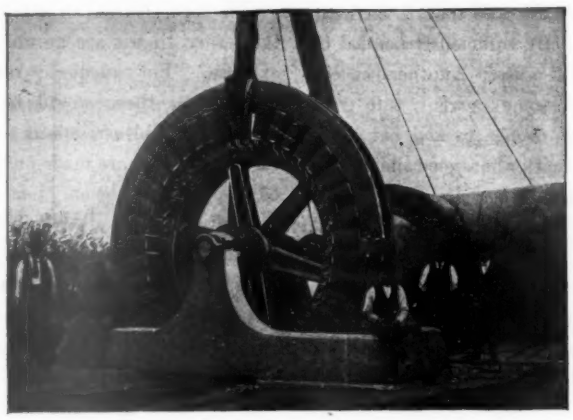

FIG. 2.—ERECTING 500 KILOWATT TRIPHASE GENERATOR AT COLUMBIA, S. C.

The Columbia Mills Company (an organization composed mainly of New England capital) have had in contemplation for some time the erection of a large cotton mill in Columbia, S. C., to take advantage of the situation as regards supplies, labor and a fine water-power close to the town. Last year this enterprise was pushed to a conclusion, but on making the detailed plans for the work, it was found that, owing to the situation of the power and land available for the mill purposes, it would be highly advantageous not to erect the mill directly at the power, but to transmit the energy for driving a distance of about 800 feet. In connection with this, of course, all well-known plans for delivery of power were carefully canvassed by the company, and by Lockwood, Greene & Company, their engineers. While it would have been entirely feasible to employ a wire rope drive over such a short distance and the initial cost would not have been very great, it soon became apparent that an important economy would be effected by dispensing with the ordinary complicated and costly system of shafting employed for distributing power about the mill and substituting for it light overhead shafts driven by individual electric motors, placed in the most advantageous position. But here, again, difficulties were encountered, for in textile manufacturing it is most important that a uniform speed should be obtained, in as much as the falling off of a few picks per minute (owing to increased load) produces, in the aggregate, serious diminution in the output of the mill. After careful consideration the triphase system of the General Electric Company was selected, with special view to the uniform speed to be obtained in the motors, and the total absence of commutators and collecting devices, which might cause troublesome and dangerous sparking. To further increase the efficiency of the system, it was decided to directly couple the dynamos to the turbines, although the available head (25 feet) introduced a serious limitation in the possible speed.

The total amount of power to be transmitted was over 1,000 horse-power, and it was decided to divide this into two units at the generating station. Consequently, two special slow-speed triphase generators were designed to meet the requirements of the case. One of these colossal machines of 500 kilowatt capacity is shown in Fig. 1. It has 40 poles and operates at a normal speed of 108 revolutions per minute, giving 36 cycles upon the line at a voltage of about 575 at the dynamo terminals.

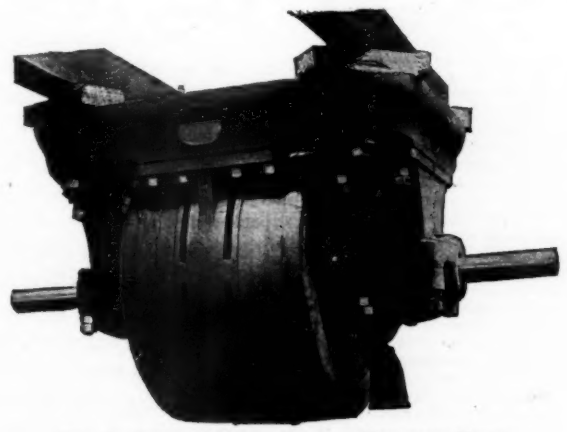

FIG. 3.—TYPE OF MOTOR USED AT COLUMBIA MILLS.

The armature is 10 feet in diameter and is of singular and massive construction. It is of the ironclad type and is wound with a single bar per slot, heavily insulated, a construction which gives practical freedom from burn-outs and other electrical difficulties.

Two of these huge machines were completed in the early part of the present year and shipped to Columbia, where the turbines (shown in position in Fig. 4) were nearly ready to receive them. The transportation and erection of these machines was a matter of no small difficulty. A wrecking car lent by the railroad company enabled them to be unshipped from the cars, and they were then slowly moved, as one would move a house, along a somewhat circuitous route to their final position, where huge temporary shears were erected to place them upon their foundations. Fig. 2 shows one of the generators just placed in position, the power house proper not yet having been placed over them. The power plant consists of two pairs of 48 inch cylinder gate turbines, which are directly connected to the generators. The generating station is connected with the mill by an underground conduit of planking, protected by pitch and asphalt, the bare wires being placed in position in a bedding of asphalt. The conduit thus constructed rests on a blind drain, and is carried across the canal to the power house under a bridge which is there erected.

In the mill there are seventeen 65 horse-power motors hung overhead and driving sections of line shafting with direct belting. The speed of the motors is 535 revolutions per minute, and varies less than two per cent from full load to friction load. These machines have neither commutators nor collecting rings, and even the armature rheostat requires almost no attention, inasmuch as it is operated from the floor by means of a lever thrust into the switch socket.

All interior wiring is in conduit tubing, and the switches are boxed in. In addition to the motors, several hundred lights are used in the mill, and can be operated either from the main circuit or in part from either of the two 25 horse-power exciters which were provided with surplus capacity with the above in view.

The mill is not yet all in place, but on the 24th of April the big generators were started and the motors given a preliminary spin.

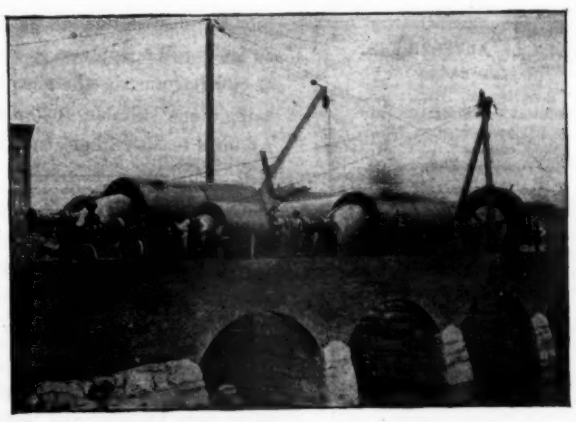

FIG. 4.—TURBINES AT THE COLUMBIA MILLS.

The Electric Railway and Power Company, of Tiffin, O., has become a part of the consolidated system, placing all of Tiffin's city and interurban railways under one management.

ELECTRIC RAILWAY NOTES.

The Austin, Tex., Rapid Transit Company contemplates an extension of one and one-half miles.

Ground was broken at Savin Rock, Conn., last week, for the building of the Merwin's Point electric road which is to connect with the West Haven road at Savin Rock.

It is reported that capitalists have been arranging for the building of an electric line from Columbus to Springfield, O., via the National Road, and have given assurance that it would be built.

Belding, Mich., capitalists talk of building an electric railway from the city to Grand Rapids, via Reed's lake. This would shorten the distance between the two places by rail from 49 to 25 miles.

The Buffalo, N. Y., Railway Company has two parties of men at work on the William street line laying rails preparatory to equipping the line with electricity. The men are working from both ends.

The Murray Brothers, of New Brunswick, N. J., have been awarded the contract to pave and lay 30 miles of track for the Brooklyn, Queens County and Suburban Railroad Company, of Brookyn, N. Y. The work will be done at a cost of $5,000 a mile.

The Union and Middlesex Traction Company have, it is understood, obtained a long coveted concession from the Board Aldermen of Rahway, N. J., and will now push their electric line to completion. It will extend to Sewaren and Boynton Beach, on Staten Island Sound.

The Consolidated Traction Company has another big scheme on foot. The idea is to carry freight between New York and Newark, N. J., by trolley. Manager Young, of the company, said last week that as soon as all the lines of the company should be equipped with electricity the freight scheme would be worked out.

The electric railway on the battlefield of Gettysburg, Pa., is about to go. The Government Commission on April 28 served notice on President Hoffer that the United States would condemn every portion of the railway that is on ground which was occupied by Federal or Confederate troops. This will remove the line from the "Valley of Death," the side of "Little Round Top," and along "Hancock's Front."

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It is stated that one of the proposed new elevated railroads in Chicago is to cut right through the blocks of buildings, forming an arcade with abutting stores and shops, thus avoiding the destruction of the buildings entirely. We suppose in such a case electricity must be the motive power, being alone suitable for such a plan. Another feather in electricity's cap.

The Chicago-St. Louis electric railway fiasco of 1892–3 is said to be reviving, but this time the more practicable speed limit of 100 miles per hour is promised. It may be that sufficient capital can now be enlisted, and the enterprise got under way. With light low cars and large wheels, a good speed might be maintained on a track of moderate weight, and after some active experimenting conditions might be reached permitting a comparatively high speed. But will it pay?

RAILWAY ELECTROLYSIS.

There has been lately a good deal of cross-firing among investigators of this subject. Numerous authenticated cases are cited of pitted and punctured water and gas pipes. One set of men argue that it is all due to defective return circuits, and that if the heavy rails are only sufficiently bonded the trouble will cease. Another set contend that some current will go to earth and thence to and out of the pipes, no matter how good the metallic return circuit may be. The former have the support given by the fact that with a heavily bonded track properly done, the loss of pressure in the return circuit is vastly reduced and can be proved by actual measurement. Their opponents do not seem to have the weight of facts on their side. They find the electrolytic pepper-pots it is true, but they do not set up the proof which would convince, *i. e.*, that if the rails are bonded so as to make the carrying capacity of each bond, or set of bonds, fully equal to that of the rail, the electrolytic action would still continue.

It seems a pretty hard thing to believe, that, with a track resistance as low as such construction would bring it, any considerable amount of current would flow through the soil to the underground pipes, along them and then out of them back to the generator. Theoretically there would be such action, undoubtedly, but we do not believe that under the given condition of extreme low track resistance enough current would flow out of the water pipes to make a measurable impression in years. The ordinary rail now used in large cities is at least 70 pounds per yard, and on double track roads four of these are available for return circuit, having a combined capacity equal to a bar of copper nearly five square inches in sectional area. We venture to assert that none of the investigators among those who have made actual tests and measurements, has done so with the rail circuit directly equal to this condition, or has supplemented an almost open track circuit with enough copper return mains to bring the status up to the theoretical carrying capacity of the track rails combined.

Yet it could be conclusively tested right at some point of one of the heavy railway systems where the railway electrolysis has been found particularly active. And the test would not necessarily be very costly. Let a mile of track be overhauled, and the rails bonded with flat plates of copper heavily riveted, or with *enough* rail bonds to insure the electrical continuity of carrying capacity through the rails and joints, so that in respect of the return circuit it would be as though the rails were jointless. One thousand dollars would go far towards paying for the mile of double track, if not cover it entirely. Then there would be something tangible to go by.

Side feeds, buried or overhead, for the return circuit are an unnecessary expense. For adequate results in many cases there would be several very heavy cables required. Empirical calculations are made on the basis of copper at normal temperature, and often, if not always, the heating effect of the current is neglected. It is easy to see how far astray one can be led in that way. The current is too much for the cable capacity, and the cable can heat up to quite a high temperature, high enough to most seriously upset the calculations.

But there are earnest men carefully studying the problems now, and we shall hope for a final settlement of the question in the near future. It ought to have been one of the first questions to settle, but somehow in the early days of electric railways it got lost in the throng of what were at the time deemed more important details.

Electrolytic metallurgy seems to have come to a standstill. We hear only of copper and aluminium now being produced commercially. Both of these industries have grown to heavy proportions and are a great success. The production of the abrasive carborundum is effected by the electric current, it is true, but is hardly an electrolytic process in the true sense. Yet it is a striking illustration of the applicability of electric current to entirely novel processes which, intelligently guided, lead to established and remunerative business enterprises. Let us have some more of them, by all means.

There are rumors afloat that the Manhattan Elevated Railroad Company has begun seriously to consider the advisability of electrically equipping its system. We cannot expect electric motive power to spring into existence all at once on so stupendous a system. Even if ready to-day to begin the much-to-be-desired change, it would take a long time to complete; and with all the dragging and interminable delay of real rapid transit, we would not be surprised if the revivified commission would be the first, after all, to bestow this great boon upon the metropolis.

The National School of Electricity, Thomas A. Edison, dean, is the latest.

CORRESPONDENCE.

OUR CHICAGO LETTER.

Prof. John P. Barrett and family are sojourning in California, enjoying that glorious climate.

The Sioux City Street Railway system was bought in by the bondholders at a foreclosure sale this week.

Mr. D. H. Louderback has purchased Siemens & Halske generators for the power plant of the north side lines.

Mr. A. S. Hibbard, general manager of the Chicago Telephone Company, has returned to Chicago after an extended business trip.

Mr. Alfred Slater, manager of the Neenah-Menasha telephone exchange, and Miss Alice Knight, of Janesville, were married on Monday.

Mr. Will Hine, general manager of the Wallace Electric Company, favors the members of the Lake View Presbyterian Church with a solo or two on the Sabbath.

Mr. F. E. Drake, 623 Home Insurance building, is completing arrangements for the furnishing of competent help to central stations under very favorable circumstances.

Mr. Ned Fox, the Chicago representative of the Phœnix Glass Company, is showing some very attractive samples of electric glassware at his warerooms on Wabash avenue.

The Metropolitan "L" has finally decided to adopt electric motive power. The outcome will be watched with the greatest interest by street railway men in all the larger cities.

The Chicago Fire.—A reproduction of the great fire of 1871 is to be operated by electricity in a park on Fifty-fourth street and Prairie avenue. Mr. H. M. Underwood is the secretary of the company.

The Supreme Court of the State of Ohio has handed down a decision that the Nichols' law taxing telephone, telegraph and express companies is constitutional. The telephone companies have already complied with the law.

The Chicago office of the Postal Telegraph-Cable Company has sent out a notice requesting all patrons expecting to move to send timely notice to care for the call boxes in order that wires may not be disconnected and circuits rendered useless.

A new arc lamp having so little mechanism as to appear almost too simple to afford excellent service, will shortly be placed on the market by one of the most enterprising and progressive of large manufacturing companies. In this lamp the carbons are fed by gravity.

As an aid in booming a real estate scheme, the building of a section of the Chicago and St. Louis Electric Railway has been started. Chief Engineer Hughes expects to have 24 miles, extending from Chicago to New Lenox, in operation as a suburban line by the Fall. It is proposed to erect the power house at Lenox.

The Chicago Edison Company complained to the Mayor that the company had been refused permits for tearing up certain streets until a sum sufficient to reimburse the city was advanced. Receiving no encouragement from the Mayor, the company handed over a check for $2,863 to pay the cost of repairing sections of Adams street and Fifth avenue.

The Union Electric Company, 207 South Canal street, Chicago, may be reorganized and placed on a more favorable working basis. The primary battery, the manufacture of which is controlled by this company, is one of the best for steady power service that has yet appeared. Mr. C. L. Aldrich, the solicitor-general of President Harrison's administration, owns a majority of the stock.

Kohler Brothers, Monadnock, Chicago, in addition to retaining the agency for the Eddy motors, have secured the western agency for 14 States of the electrical apparatus now built by the Walker Manufacturing Company, of Cleveland, and will push the same aggressively in the street railway field. This is probably one of the most important agency deals that has been placed for a long time.

Dr. W. M. Stine's many friends will learn with regret of the sad death of Mrs. Stine, at Indianapolis, on Tuesday afternoon. During the past five months Dr. Stine has spent the greater portion of time at the bedside of his wife, either in Florida or in Ohio, but made a flying trip to Chicago on Monday to attend to some business matters, and received the telegram announcing her death just as he was stepping aboard the train to return to Indianapolis.

Judge Grosscup has refused a new trial in the case of Wilbur F. Davidson, of Port Huron, Mich., the agent of the General Electric Company, against the Illinois Central Railroad Company, in which the jury rendered a verdict against the railroad for $43,000 for personal injuries. While refusing to give the railroad another trial Judge Grosscup reduced the verdict to $25,000, on the ground that $43,000 was more than was necessary to compensate the complainant.

Mr. Dion Geraldine has a new remedy for the smoke nuisance. He proposes to form a company that will contract with owners of steam plants to operate the plants at present cost. "In this way the owners will be relieved of all the responsibility of hiring engineers or firemen and of buying fuel. We will give a bond to furnish heat, power or light, or all of them, and at the same time to do away with smoke. We will purchase the fuel and be responsible for the care of the machinery. Many owners of steam plants, especially in large business blocks, know little about the operation and less about fuel. This is usually left with the engineer, who has no incentive to economy. We will take all this responsibility, and through improved facilities and economy make a living profit out of what is now going to waste." F. De L.

Chicago, May 7.

Wall Street and the Electrical Stock Market.

The tendency of the market for stocks and bonds during the week has been toward reaction. It was very narrow and largely professional. As in cases of a professional market devoid of any investment demand, the electrical securities suffered marked inactivity. There is little or no inquiry for the inactive shares, while the active stocks showed slight declines.

Western Union was advanced under manipulation from 83⅜ on Monday to 85½ on Tuesday, from which it sagged fractionally. The Collateral Trust 5's are quoted at 106¾ to 107. Almost daily I hear reports of growing opposition to Western Union by the Postal Telegraph. This company now has the undivided support of Mr. Mackey and Commercial Cable, and is said to be making great inroads on Western Union. It has the advantage in its operations of touching only commercial centers without taking the dross to be found in the by-ways.

Edison Electric Illuminating sold Friday at 102¼. The first 5 per cent bonds were unusually active from 104 to 107¼.

General Electric opened the week at 38⅝, touched 40⅛ on Tuesday and reacted to 38⅝ Friday, ranging around 38 to-day. Two very important decisions during the week contributed to the strength in the stock. One was a decision by United States Circuit Judge Townsend at New Haven, sustaining the company in an action for infringement against Stephen D. Field's electric railway patents. The other was the celebrated "Oconto" case tried in the United States Court of Appeals in Chicago, overthrowing the Goebel claim. The decision is final, and it is said the hope of the alleged infringers of the Edison patent now lies in a final hearing in the case of the Columbia Incandescent Lamp Company, of St. Louis, of which testimony is now being taken.

There were no new developments concerning the internal affairs of General Electric during the week. I was informed by an executive officer that it had not purchased, for retiring purposes, any of its debenture bonds. Such purchase was contemplated, but was not considered wise at this time. It seems that the idea on the part of some of the managers of the company was to avail of the comparatively low price at which the bonds are now selling, thereby employing its surplus. I understand that it was decided best to keep what surplus money the company had intact for the present. The directors have not met since the annual meeting, although I am told they will have a meeting as soon as a quorum can be gotten together. The fact that the directors are scattered between Boston, Schenectady, and New York, and all of them active business men, renders it difficult to secure a quorum. I was authoritatively informed again this week that the question of taking action regarding the impairment of capital had not received consideration and probably would not be adjusted for some months.

The talk of the company's retiring the debenture bonds had the effect of strengthening those securities somewhat. They were quoted at 87. The preferred stock was steady between 69 and 70. It is certain that this stock will not receive a dividend until the impairment of capital is settled. I make this statement on authority.

On the Boston Exchange, Bell Telephone was steady, from 190 to 191, without activity or feature. New England Telephone sold between 53 and 54; Fort Wayne was bid 2½ and held at 3; Erie Telephone ranged between 46 and 46½. This company has declared a quarterly dividend of 1 per cent, payable May 20.

Westinghouse securities held their own, with the first preferred selling at 50½ and the assenting certificates at 37½. The company will hold its annual meeting at Pittsburgh on Wednesday, May 16. The books for the meeting close May 7 and open May 17. Bain.

New York, May 5.

PERSONAL.

Mr. H. M. Littell, of New Orleans, La., was in New York last week.

It is rumored that Mr. John Kreusi, of Schenectady, will resign from the General Electric Company.

Chas. H. Stoll, of Lexington, Ky., one of the Breckenridge lawyers, is largely interested in electric lighting and traction in his city.

The Franklin Institute has awarded the Elliott-Cresson medal to Mr. Nikola Tesla for his researches in high frequency phenomena.

Mr. O. W. Mysenburg, president of the Siemens & Halske Electric Company, of America, has returned from Europe after an absence of six weeks.

Mr. P. H. Alexander has been appointed manager of the lighting and power departments of the Electric Selector and Signal Company, of New York city.

Mr. W. E. Gilmore has been appointed private secretary to Thomas A. Edison. Mr. A. O. Tate, who has been Mr. Edison's secretary for several years, will hereafter give his attention to the kinetograph.

The Pennsylvania Traction Company has appointed J. Clemsen Sharpless engineer in charge of surveying the permanent routes for their electric railway from Parkesburg to Philadelphia and its several branches.

Plaint of Central Station Men.

Nothing to plant but poles,
Nothing to string but wire,
Nothing to burn but lamps,
So we can get our hire.

Nothing to sell but "juice,"
Nothing to write but bills,
Nothing to get but smiles,
With which to fill our tills.

Nowhere to go but out,
Nowhere to come but back,
Nowhere to sit but here,
Nothing but jokes to crack.

Nothing but bills to pay,
Nothing runs but the clock,
Nothing to spend but time—
Of that we have a stock.

Nothing grows but our debts,
Nothing to keep but mum.
Nothing to do but wait
For better times to come.

Voltabout.

THE ELECTRIC RAILWAY.

A LECTURE IN THE COOPER UNION ELECTRICAL COURSE DELIVERED BY T. COMMERFORD MARTIN.

(*Continued from page 220.*)

So much for the overhead structure, but what of the track? Mr. Vance had hoped to use his old flat, center-bearing rails in the outskirts, but he soon became convinced that they would not do, although he was staggered when he learned that some trolley companies had actually put down girder rails weighing as much as 100 pounds to the yard, or nearly twice as heavy as those generally used on steam railway tracks. The reason is mainly that the trolley cars are very heavy and that the conditions of paving and street track are severe. These rails form part of the return circuit to the power house, the car being in parallel or multiple between the trolley wire as one side of the circuit from the generator, and the rails as the other side. But the rails being discontinuous or in short sections, they are heavily bonded as a rule with copper links joining rail to rail, and the opposite sides of the track being then cross bonded so as to be practically all one common return. Even then the return has been found insufficient, and the current straying away from it has often played havoc with gas and water pipes by electrolytic action. Mr. Vance was advised that the only way to prevent such trouble was to make the system one of metallic balance on both sides of the circuit as regards conductivity; and as a result he had feeders from the power house to the track just as he had to the trolley wire. As a consequence the current had no opportunity to stray away; the track return offered no undue resistance, and the economy of the system was greater because he was not pumping current into the ground and getting all the pipes of the city into a state of nervous excitement and collapse. All that an electric current asks for is a proper circuit. Give it that, and it will never wander away from the straight and narrow path.

We have now seen Mr. Vance provided with his overhead trolley line construction, his solid new track and his new power house. All that he now needs is his equipment of motor cars. His old horse cars he can and will use as tow cars or "trailers," but he has no small problem to deal with in the selection of his motors. He has a great variety from which to choose, for we are very far from uniformity yet. The power of the armature of the motor may be communicated to the car axle and wheels in many ways, and almost all of them are still in use, although one or two now preponderate greatly. The armature may be directly mounted or sleeved on the car axles and thus drive them directly without any reduction in its speed to that of the wheels by intermediate gearing. Such motors are known as gearless, and they charmed Mr. Vance by their simplicity in spite of their greater weight. But Tariffville is in reality a long, narrow street for miles, and he was held down to a certain low speed at which he feared that gearless motors would be inefficient because he could not let them travel at the high rate of revolution desirable for true efficiency with such a type. Mr. Vance was also much captivated by types of cars with only one motor under the car instead of the usual two. He said that two motors always suggested combination fixtures to him, the anxious idea being that one would serve if the other gave out. With single motors he had the choice of, at least, three notable types. In one of these there was an ingenious sort of Siamese twin machine with common field parts for two armatures, while in the others a single motor was mounted lengthwise of the car, instead of across, and gave up its power to the car axles by means of bevel gearing. In yet another case, a motor car was offered to him with the single gearless motor mounted across the car between the two axles, running at the same speed as they and driving by means of side connecting rods as in a steam locomotive. Mr. Vance bought two or three of all these types of single motor cars, so that he could find out for himself what they amounted to, and so that when he came to increase his equipment he could get more of them if he liked them. As a matter of fact, by far the larger of his first equipment consisted of what are known as single reduction motors. These motors are of the spur gear type. In other words, a small gear on the end of the armature shaft meshes directly with a larger gear on the car axle. Mr. Vance was offered, on advantageous terms, some of the older double reduction motors, in which the armature speed undergoes two reductions, but they seemed to him so clumsy and so noisy that he chose modern single reductions with machine-cut steel gears encased in tight covers, and so worked out as to give a car speed of about 10 miles per hour for about 500 armature revolutions per minute.

The admission of the current to these motors is governed by controllers, which throw them into desired relations. The motor having its fields and armature in series is now the standard in railway work, for the reason that it is more easily governed under the working conditions than a shunt motor. The common practice is to employ what is known as a series multiple controller, which in the hands of the driver has been thought sufficient to govern the car speed, supplemented by a rheostat and a brake. Mr. Vance adopted all the latest refinements, but in the operation of his cars he has come to the conclusion shared by many, that the means of car control are hardly yet equal to their work. He and his superintendent are now experimenting in that direction and already talk of taking out some patents on more sensitive and prompt mechanisms. Children and drunken men will stray across his tracks, and while he does not expect to find a controller that will automatically reverse when within 10 feet of anybody ahead, he does expect to invent or adopt something which will justify him in his prejudice against what he calls "calf catchers," more usually known as fenders.

The only link left in the equipment is, of course, the trolley pole on the car, and naturally in a first equipment, Mr. Vance choose two or three kinds. The common feature is, as most people know, a sort of fishing rod swiveled and held by springs to run either way, and carrying at the top a small deeply flanged wheel of brass or bronze which, as it rolls, picks up the current. The circuit is then down or through the pole, through the lightning arrester, the controller, and the motors to the truck and the rails, and thus the circuit is completed. Mr. Vance has not yet got over his wonder at the fact that through such wonderfully small areas of contact as the wire and the little wheel afford current enough can easily and safely pass to run a motor car, three or four trailers and four or five hundred passengers, representing a load of a great many tons.

There was nothing mean or small about Mr. Vance when he got his road going. The public had made pretty hard terms with him, but he believed deeply that a good service pays better than a poor one. Each of his cars was lighted by a group of incandescent lamps drawing current from the trolley wire. When Winter came around he threw out the coal stoves and put electric heaters under the seats. He put on a couple of private cars sumptuously fitted up, so that the people could go to the theatres or to surprise parties in style, yet cheaply. He collected mail matter in the suburban districts and expedited postal deliveries by two or three hours. He bought a splendid funeral car which enabled the poor to bury their dead decently and with honor, without bankrupting themselves for a couple of years. He was, moreover, careful of his men, knowing that a stiff brake may be far worse than a balky horse, and that there are easier jobs than that of a street car conductor. He saw to it that the front platform was vestibuled in Winter for the drivers and thought there was no great harm done by rest houses for passengers at all junctions and terminal points.

Such is the electric road at Tariffville, put in by Mr. Vance, and I think you will believe me when I say it pays.

The second and brief last part of my paper deals with what may be called the ideal and possible conditions of electric traction. The success of the overhead trolley road in the manufacturing suburban city of Tariffville did a great deal to arouse public sentiment in the big city just across the river, and Mr. Vance's road ran its trolley wires right up to the city limit, but there they stopped, under an absolute prohibition. If the great metropolitan center of Yorkton was to have real electric rapid transit it must get it by some method that did not restore the wires to streets from which they had been ruthlessly banished; and even then it was obvious that no high speed could be attained unless the tracks were either raised above the surface or carried below it. The limit of speed is no fault of either a storage battery road or a conduit road. I have traveled at a rate of 15 or 20 miles an hour on roads of either type, or much faster than the New York elevated. But it is evident that on the street surface, in crowded thoroughfares, speed must be cut down, no matter what the ability may be to increase it. If the inhabitants of Yorkton, therefore, were to have fast electric rapid transit, it must be either by the familiar elevated system or the underground. Successful examples of this were ready at hand. In Liverpool, as at the Chicago World's Fair, the trains are hauled by a single motor, picking up current from a third rail by means of a sliding shoe contact, but a little difference exists in the fact that at Liverpool each train, consisting of two cars, has a motor on each car, situated at the extremity of the car. The train is run by a motorman who, sitting at the front of the train, throws into circuit the motor at the end of the train, so that the train is pushed rather than pulled. On the return trip this method is reversed, and, in this way, each motor has a rest, just like a relay of horses. The London underground road, on the other hand, closely approximates the Chicago road in having a big electric locomotive, normally hauling a train of three passenger cars, and capable of handling a load of 42 tons at 26 miles an hour. This electric road, be it added, consists of two parallel iron tunnels, 60 feet below the surface.

(*To be concluded.*)

TELEPHONING WITHOUT WIRES.

Telephoning Without Wires.

TO THE EDITOR OF ELECTRICAL REVIEW:

In your issue for April 18, 1894, I notice the account of some telephonic experiments made by the Abbe L. Michel and published by him in *Cosmos*, March 3, 1894.

Mr. Michel relates that he has been able to transmit musical sounds between two telephone instruments having no continuous metallic conductor, the intervening distance being 120 metres. He also states that now and then he was able to understand clearly enunciated phrases. In this experiment both conductors of the transmitting instrument are earthed, but at different points of the ground. Mr. Michel concludes his account with the assurance that "telephony without wires is a fact."

Although this experiment is interesting, it has clearly neither a commercial nor a practical value as soon as a large number of telephonic transmitters are to be operated within a limited area, and especially in districts where the soil is traversed by heavy electric currents. I desire, however, to call your attention to the fact that the ELECTRICAL REVIEW under date of June 24, 1893, published a much more promising method of transmitting vocal sounds without individual conductors, which method was originally communicated to the *Génie Civil* of Paris.

This article is entitled "Telephonic Intercommunication by Means of the Water and Gas Systems of a City," and it is stated therein that the experimenter succeeded in transmitting messages between two houses, distant several hundred metres. It should be noted that Mr. Michel employed a battery of five accumulators, while the correspondent of the *Génie Civil* accomplished vocal transmission with but three bichromate cells.

The latter method, *i. e.*, connecting one conductor of a telephone to a faucet, and the other to a gas main is, of course, old and well known, but it may be of interest to say that in the city of Cambridge, Mass., and in fact, I believe, in any of our large cities where the rails serve as the return conductor for railway currents, sufficient current traverses the water and gas mains to conduct the above described experiment, using the leakage current as the electric source for the two transmitting instruments.

Yours respectfully,

V. M. BERTHOLD.

Cambridge, Mass., April 27, 1894.

The Consolidated Railway Company, Cincinnati, has announced its intention to equip all its horse lines with electricity as soon as possible.

ELECTRIC LIGHT FLASHES.

Hart, Mich., wants electric street lights.

Irvington, N. Y., will have electric lights.

There is talk of electric lights for Eatonton, Ga.

An electric light plant at Hillsboro, N. H., is a possibility.

The citizens of Geneseo, N. Y., will have electric lights by a vote of two to one.

The Brush Electric Light and Power Company, at Aurora, Ill., has surrendered its charter.

Hawarden, Ia., will have electric lights by a vote of the citizens, only one negative vote being cast.

The Lewiston and Auburn, Me., Electric Light Company has about 4,500 incandescent lights in the two cities.

It is probable that the affairs of the Oshkosh, Wis., Electric Light and Power Company will soon be settled and the company reorganized.

The Bramwell and Pocahontas, Va., Electric Light Company will be reorganized under the name of the Bluestone Electric Light Company.

A bill has passed the New Jersey House requiring boards of freeholders to light public roads with electricity for a distance of four miles from the court-house.

The transfer of the three electric light companies at Newport, Ky., has been completed, and the work will be done in future by the Suburban Electric Light Company.

Judge Dickson recently refused to grant the injunction asked for by the Leadville, Colo., Electric Light Company to restrain the Citizens' Electric Company from building a plant.

W. M. Williams has bought the plant of the South Milwaukee, Wis., Electric Light and Power Company, and is now operating it. Mr. Williams was formerly a director of the company.

The Milwaukee, Wis., Arc Light Company has complied with the order of the Board of Public Works and taken down its overhead wire to the Liederkranz Hall. The company promises to comply with the law and put all its wires underground.

The Westmoreland Electric Company, of Greensburg, Pa., which recently bought the People's company's plant, is making extensive improvements in the plant, which will cost $12,000 to $15,000. The meter system will be adopted.

The entire electric plant of the Capital Gas Company, at Sacramento, Cal., which holds contracts for the lighting of the city and the running of the street cars, was recently destroyed by fire. Twenty-four dynamos were burned and half a dozen of the most powerful engines on the coast were practically ruined. Loss, $300,000.

Negotiations were recently completed whereby the two electric companies at Elkhart, Ind., were combined and are now operated under the name of the Home Electric Light and Power Company. The new concern is managed by G. W. Spohn, as president; William H. Hornberger, vice-president; and J. E. Micks, secretary and treasurer.

George Urban, Jr., Henry W. Box, Henry Koons, C. R. Huntley, Edward Michaels, of Buffalo; J. C. Lammerts and Walter P. Horne, of Niagara Falls, directors of the Buffalo and Niagara Falls Electric Light Company, have entered into a contract with the Niagara Falls Power Company, whereby the latter is to furnish the former with 1,000 horse-power to supply a new lighting plant which they purpose soon to put into use.

By sending 20 cents to Melvil Dewey, secretary of the University of the State of New York, Albany, N. Y., central station managers and others interested in the subject can secure a copy of a comparative summary and index of State Legislation in 1893. This covers not only New York State, but every State in the Union, and forms a most convenient book for reference where legislative subjects are under consideration.

A European Incandescent Lamp Syndicate.

A correspondent writes under date 19th April: An important conference took place in Berlin between representatives of most of the leading European incandescent lamp manufacturers, when it was decided to take steps to form a syndicate of European incandescent lamp manufacturers. At the same time the price of lamps was fixed at 75 pfennig each for direct consumer; 65 pfennig for merchants.

Decision in the Oconto Lamp Case.

A decision was handed down on May 1 by the United States Circuit Court of Appeals, confirming the finding of Judge Seaman in the case of the Edison Electric Light Company against the Electric Manufacturing Company, of Oconto, Wis. The court held that the Edison lamp patent should be protected from invasion *pendente lite*.

W. S. Hill Electric Company's New Switch.

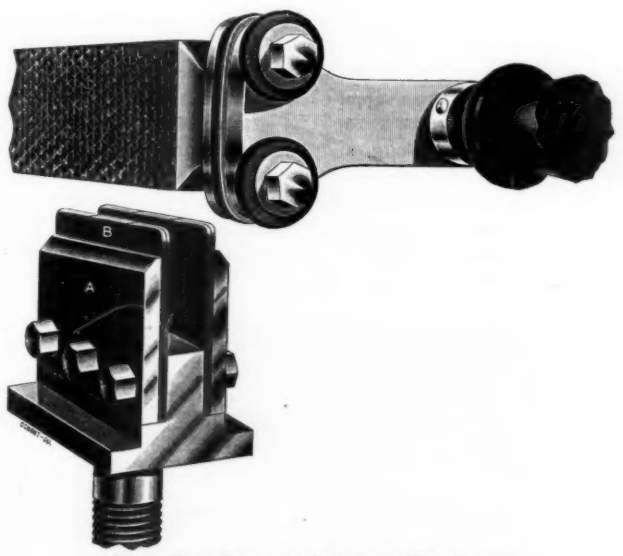
We herewith illustrate one of the latest improvements in the switch line by the W. S. Hill Electric Company, letters patent for which have just been issued bearing the date of April 24, 1894.

The first feature in the invention is the manner in which the two or more blades are secured to the yoke so as to obtain rigidity, and keep all of the blades in proper alignment while the switch is being operated.

By the old method of securing the blades to the yoke (to which the handle is attached) by a single bolt or screw in each blade, there was nothing to prevent the twisting of the blades, thus allowing one to move in advance of the other, and as the two or more poles would not break in unison, excessive flashing would result.

To overcome this defect and produce a more mechanical and substantial device, the outer ends of the blades and yoke have been broadened and two screws or bolts inserted, thus securing the parts so rigidly that the blades must at all times move in unison, and all the blades leave the contacts at the same instant.

The second feature consists in backing up the regular flexible contacts B by what they term "reinforcing plates," A. It has, heretofore, been the custom to use nothing but the copper strips B, and these, of necessity being flexible, were liable to spring apart by constant usage, thus impairing the contact and causing the parts to heat.



W. S. Hill Electric Company's New Switch.

By the method shown, the flexibility is maintained and, on account of the reinforcing plates, the flexible contacts are always held in proper position, consequently, the electrical connection between blade and contact is always kept perfect.

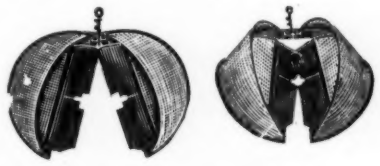
It will also be seen that the carrying capacity of the flexible copper plates B is increased by the reinforcing plate A to the maximum of any other part of the circuit, preventing loss of current in the switch and heating and destruction of its contacts.

Hundreds of these switches are now in use, and the value of the above inventions are becoming more and more apparent as the test of time is applied.

The Chicago Spark Arrester.

The Metropolitan Electric Company are introducing a new arc lamp spark arrester, known as the Chicago. Its many advantages are pronounced, and the device is one of undoubted value, while a long-felt want is at last supplied.

The Chicago spark arrester is made to fit any system, either single or double carbon lamp, and is fastened by an adjustable clamp to the lamp holder, inside or outside, and is arranged to open out, separating in the center, so that once in position it is permanently fastened, and is easily opened to each side whenever necessary to trim carbons or change the globe.



The Chicago Spark Arrester.

The cover is arranged to automatically open and close, as the carbon holder passes downward through the two mica plates. These plates are hinged and balanced, and close immediately after the holder has passed through. While held at an angle during the time (about one hour) that the holder is gradually being lowered by the consumption of the carbons, the device is so constructed that a draught is established, which draws the sparks away from the carbons, and the upper arrangement, or hood of the arrester, is so placed that the sparks cannot escape.

LITERARY.

The register for 1893-94 of the Leland Sanford, Junior, University, Palo Alto, Cal., has been received.

The official roll of the officers and members of the New Orleans, La., Electric Society has been received.

Scribner's Magazine for May opens with an article of unusual importance entitled, "Some Episodes of Mountaineering," by Edwin Lord Weeks, describing some of his own stirring adventures while mountain climbing in the Alps, with illustrations furnished by the same hand.

"A Modern Wizard," by Rodrigues Ottolengui, 16mo., paper, 50 cents; cloth, $1. G. P. Putnam's Sons, New York.

This is one of the most entertaining and absorbing novels of the year. To the scientific man who enjoys the unraveling of a complex problem this story appeals with a special force. The plot is uniquely conceived, cleverly concealed and skillfully worked out. The medical and legal questions involved are popularly and yet correctly presented. While certain situations are dependent on the apparently supernatural, yet every effect can be credited to a known scientific cause. Altogether, the story is a most interesting one, especially to the electrical and technical man enjoying a holiday.

The Johnson-Lundell Electric Railway System.

The Johnson-Lundell conduit electric railway system, which has already been mentioned in the columns of the ELECTRICAL REVIEW, is herewith illustrated and described. The inventors of the system are Messrs. E. H. Johnson and Robert Lundell, both well known for their past work in the electrical field.

The experimental road shown in the illustrations is at East Sixty-ninth street and First avenue, New York city. The track runs around a whole city block, with stiffish grades and difficult curves of necessarily short radius. The power house is at the foot of the hill and at the center of that section of the track or circuit. The generating plant comprises a vertical engine driving directly a pair of Lundell dynamos, the unit being such that it could be enlarged on exactly the same proportions up to any size for any road. Its capacity here is far beyond the need, but serves admirably to illustrate the manner in which the generating part of the Johnson-Lundell system is provided for. By means of the Interior Conduit telescopic iron tube, current is carried to the track at the proper points of feeding, and is distributed without any loss due to leakage or conduction, owing to the high insulation of the ducts. The tract itself is of ordinary construction as to the rails. Between the rails it is asphalted or paved, examples of both are shown, and paralleling the rails lies a conducting bar or strip of metal embeded in the asphalt. This bar is level with the surface and is divided up into sections with insulating blocks of stone or other material between them. Just outside the single track, or midway between the double tracks, are plain boxes with iron covers flush with the street surface. In these boxes are substantial electro-magnetic devices which deliver current to each section as the car comes along, and then lie quiet until the succeeding car rolls up. These switch-boxes are water-tight and may be compared to automatic switchmen. Each box governs its particular sections of track. The car carries a pick-up rubbing brush which leads the current into the motor and which takes the place, or fulfills the function of the trolley pole wheel. In fact, if a man were to stand on his head, and if paving stones were made of glass, he would see underneath a literal counterpart or reproduction of the trolley system, so far as the track itself goes. There is one great difference, however, which the eye does not reveal. The trolley system is alive throughout. This is not alive anywhere except at the point over which the car is passing. The difference of potential between the two sides of the circuit between which the car moves is practically and actually *nil*.

The car has but one motor, which is central under the car and drives on each axle by means of bevel gear, and with sprocket wheels and link chain in flexible connection. Its suspension is flexible, the bevels are boxed, the sprocket wheels and links mesh noiselessly; and thanks to the intervention of a bipartite screw coil in close relation to the armature shaft, the motor, though capable of instantaneous arrest or sudden starting, never moves off or stops with a jerk. The motor is iron-cased and protected against dirt, stones, moisture, etc.

Underneath the car is a steel brush which gathers up the current and passes it up into the motor, the return being, as usual, through the rails; the conducting strip between them is only alive when a car is right over it. Under the seats are frames holding a very simple, elementary form of lead storage battery, enough to furnish the voltage at which the motor runs—300 volts—and though with very few plates in each cell, giving considerable capacity. The batteries are always in place; they need no change, practically no attention, but at a moment's notice they furnish current and can carry the car through many emergencies. The batteries play one or two parts in the internal economy of the car, "picking up the circuit" for a second when it starts; lighting the car; but their great beauty is that they render the car at once self-contained and dispense with the usual costly, complicated and troublesome wiring at crossings, switches, steam-railway tracks, etc. If the car has not sufficient headway to run over a crossing, the battery will do that, just as it will keep the car going should it be deprived of central station current, or even put on a line that is without electricity.

The advantages claimed for the Johnson-Lundell system are absolute and immediate control of the car, moderate first cost, low rate of depreciation, independence of weather conditions, moderate cost of operation, independence of each car, freedom from noise and ease of adaptation and extension.

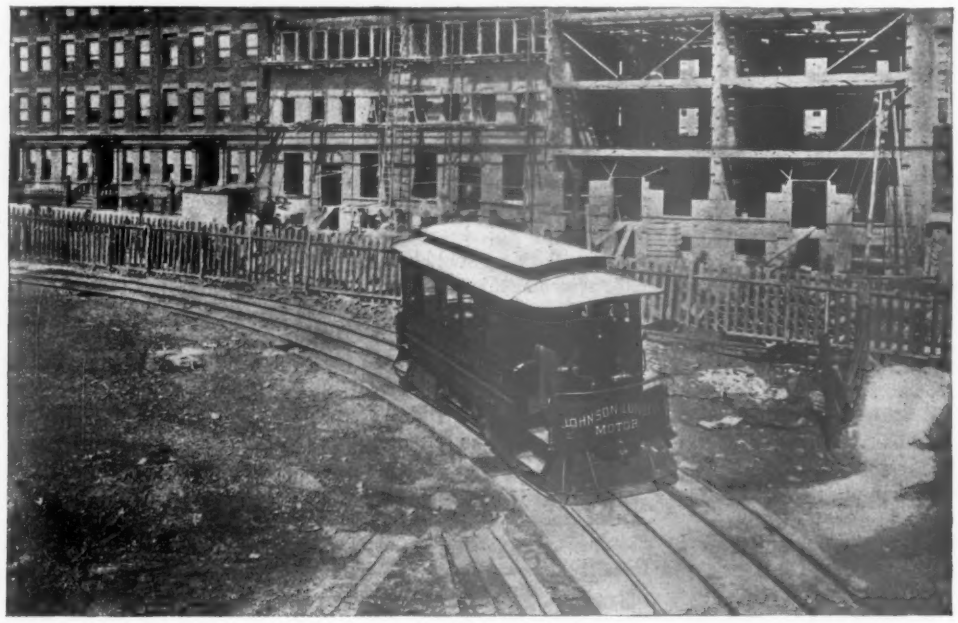


FIG. 1.—JOHNSON LUNDELL ELECTRIC RAILWAY, EAST 69TH STREET AND FIRST AVENUE, NEW YORK CITY.

FIG. 2.—OUTSIDE SWITCH-BOX, UNCOVERED.

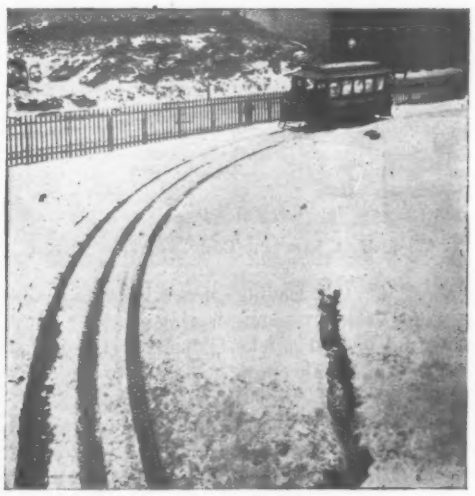


FIG. 3.—SECTION OF TRACK AFTER SNOW STORM.

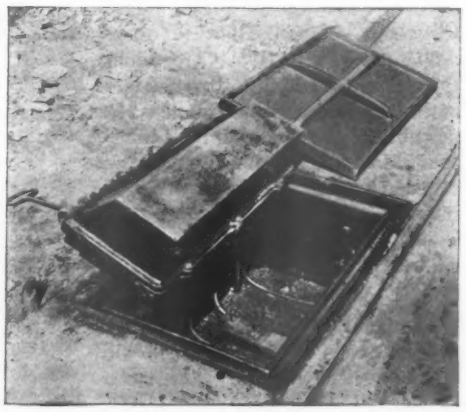


FIG. 4.—SWITCH-BOX IN POSITION FOR INSPECTION.

A New Electrical Society in Brooklyn.

Thirty young men recently organized the Brooklyn Electrical Society at the residence of Thomas A. Bamford, at No. 259 Eleventh street, Brooklyn, N. Y. They are all students of the electrical science in its various branches and have founded the society for mutual enlightenment. A paper will be read on Thursday evening, May 10, by Mr. William C. Burling, who will take for his subject "Underground and Overhead Electric Traction." The following officers have been elected: President, W. C. Burling; vice-president, W. C. Otten; secretary and treasurer, Arthur A. Fisk. Membership is open to all interested in electrical matters.

Lecture By Mr. Wurts.

Mr. Alexander J. Wurts, of the Westinghouse Electric and Manufacturing Company, read a paper on "Non-Arcing Lightning Arresters," with special reference to the protection of street railway circuits, at Columbia College, New York city, on the evening of May 4. The lecture was illustrated with practical demonstrations.

TELEPHONE NEWS AND COMMENT.

At a meeting of the stockholders of the Metropolitan Telephone and Telegraph Company, held on May 1 at the company's office, 18 Cortlandt street, New York, the following directors were elected for the ensuing year: Charles F. Cutler, Joseph P. Davis, Thomas T. Eckert, William H. Forbes, George J. Gould, Edward J. Hall, John E. Hudson, James Jameson, James Merrihew, Charles A. Tinker, John Van Horne, William Woolverton, and John H. Cahill.

The telephone girls in the central telephone office in Jersey City are indignant over an order requiring them to wear black gowns while at work, and to eat their luncheon in the office.

There is some difference of opinion about the real value of the stock of one or two of the new telephone companies and of the amount of working funds on hand, notwithstanding the very favorable reports given by the mercantile agencies.

The "W. S. P. Telephone Company," incorporated; capital, $250,000, Wm. S. Prine, president; Warren Dutton, vice-president; H. B. Higbee, secretary; Lyman Green, attorney, have begun pole construction in Petaluma and Santa Rosa, Cal., and will soon extend to other places.

The efficiency of the Swedish telephone system has long been well known, but as further illustrating the fact it is stated that the average interval between the ringing of a subscriber's bell and the establishment of the connection at the central State telephone station in November last was only 6⅕ seconds.

The telephone company at Cincinnati is reported to be well pleased with the operation of its new underground system.

R. M. Baily, of Williamsport, Pa., has been elected president of the Central Pennsylvania Telephone Company to fill the vacancy caused by the death of H. R. Rhoades. Mr. Baily will also act as general manager. C. H. Chittenden, of Scranton, was elected a director of the company.

The directors of the Missouri and Kansas Telephone Company have authorized Superintendent W. W. Smith to have a canvass made to ascertain whether the Kansas City, Kas., telephone subscribers want an exchange of their own.

Work on the new plant of the Harrison International Telephone Company at Fort Smith, Ark., will begin soon.

Mr. C. B. Nester, of Hagerstown, Md., contemplates organizing private telephone companies in Hagerstown, Charlestown, Winchester, Harper's Ferry, Shepherdstown and Berryville.

It is reported that the Harrison International Telephone Company will install a system at Rockford, Ill.

The Chicago Telephone Company is suing William B. Keep for the balance due on a note given for new stock issued when the company was building its underground system.

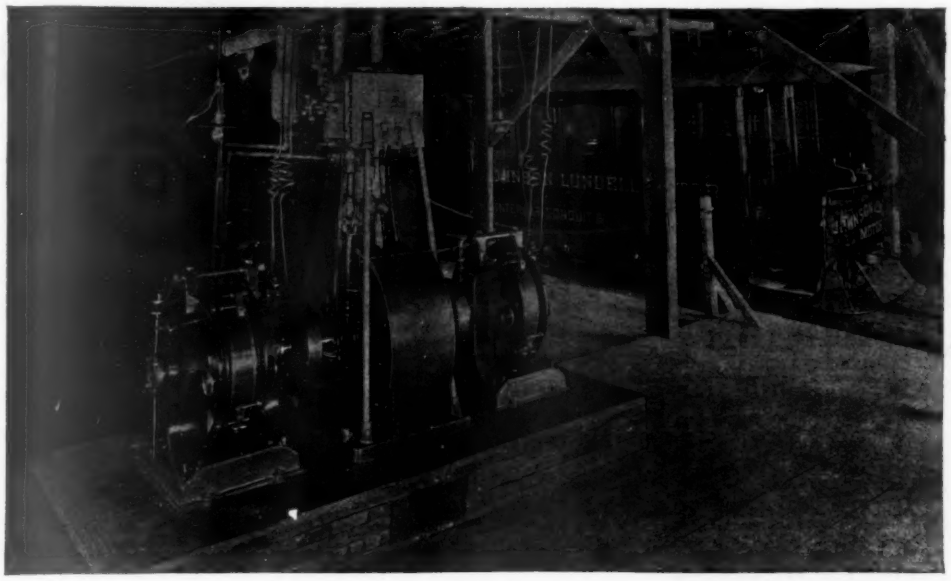


FIG. 5.—GENERATING PLANT, DIRECT-CONNECTED LUNDELL DYNAMOS.

Funeral services were held over the remains of the late A. B. Uline, vice-president and general manager of the Hudson River Telephone and Telegraph Company, at Albany, N. Y., on Sunday, May 6. The services were attended by the Knights Templar and many prominent telephone men. It will be remembered that Mr. Uline's death occurred at Nassau, N. P., and that the remains were brought to Albany last February, since which time they have reposed in a receiving vault.

A telephone company at Kalamazoo, Mich., has applied for a franchise.

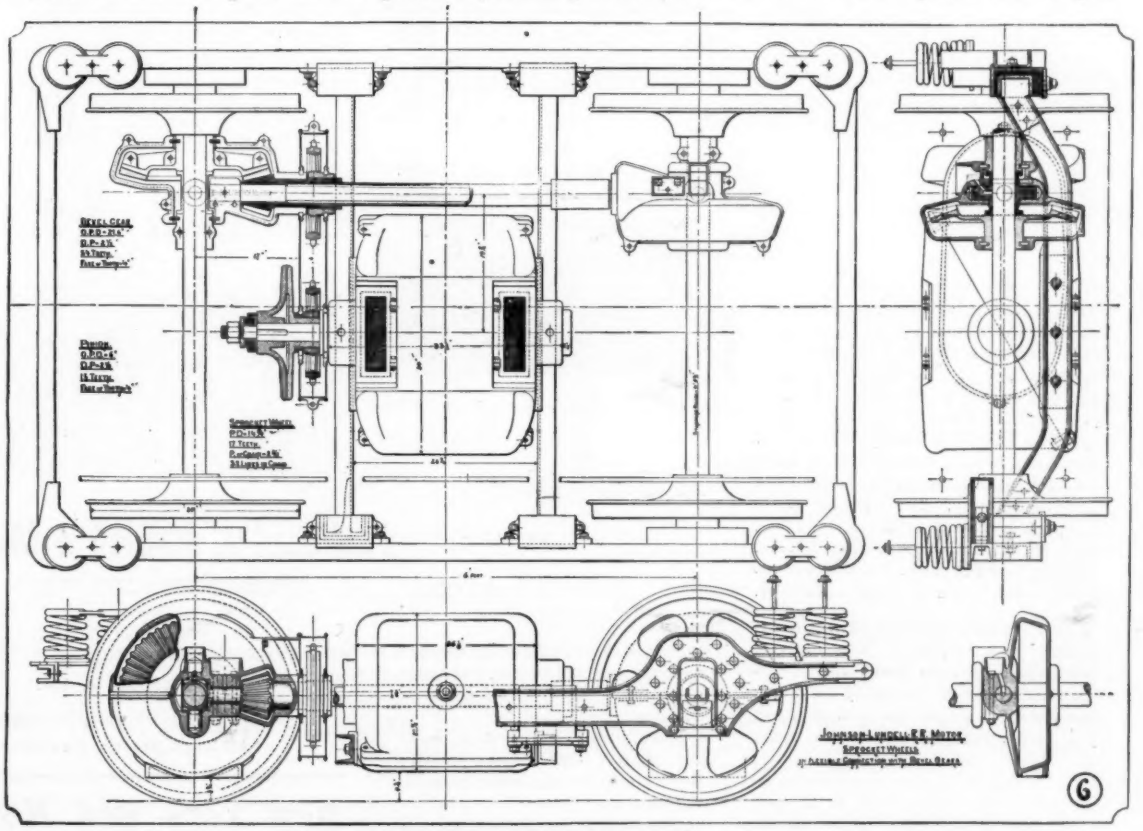


FIG. 6.—DRAWINGS OF JOHNSON-LUNDELL MOTOR CAR.

Siemens & Halske Conduit System In New York City.

The Metropolitan Traction Company announced last week that it would shortly begin the construction of new lines of road on the upper west side, which, when completed, will enable persons living in that great district to ride to City Hall for a single fare. In response to an invitation 25 of the leading uptown property owners met at the company's offices for a conference with the officers of the company.

William C. Whitney, on behalf of the traction company, addressed the meeting. He said that the subject of street railway transit in the northwestern section of the city had received a great deal of attention from the company during the last six months. As a result of this work, the company was now in a position to construct two branch lines, one beginning at 106th street and extending along that thoroughfare to Manhattan avenue, thence to St. Nicholas avenue, and along the Kingsbridge road to Kingsbridge, and the other beginning at 125th street and Amsterdam avenue and extending west to the Boulevard, thence up the Boulevard to 170th street, to the junction of the St. Nicholas avenue line. Mr. Whitney said that it had been decided, however, to adopt for experimental purposes the Siemens & Halske system.

There was a meeting of the Metropolitan Traction Company last Friday, at which several electrical experts, who had been employed to investigate the practicability of an underground electric system, discussed the efficiency of their various schemes. No definite action was taken upon the reports of the experts.

The Cleveland Telephone Company will have a new building just as soon as it can be erected.

KINDRED INTERESTS

The Wyckoff Pipe Company, of Williamsport, Pa., has received the contract for furnishing the conduits for the New York and New Jersey Telephone Company, at Jersey City and Newark, N. J.

The Consumers Electrical Supply Company, of New York city, owing to increasing business and a necessity for larger quarters, have removed from 13 Park Row to 25 East Fourteenth street, near Broadway.

The Mather Electric Company report the sale of two 120 kilowatt 500 volt railway generators to the Fox Electric Railway Company, of Green Bay, Wisconsin. This sale was made through Mr. J. Holt Gates, of 1140 Monadnock building, Chicago, Ill., Western contractor for the Mather company.

The Siemens & Halske Electric Company, of America, will manufacture alternating current apparatus and expect to have their new product on the market inside of three months. It is also expected that the company will have a new railway motor developed within the next six months.

The Rose Polytechnic Institute, Terre Haute, Ind., is one of our leading engineering colleges and is especially fortunate in its thoroughly modern equipment and plan of instruction. It lays a special emphasis on the practical side of technical education which it is enabled to do throughout the whole course of four years by its ample shops and laboratories and exceptionally complete outfit, especially in electricity.

Tobin Bronze.—It is said that Captain MacCalmont, a wealthy banker and a connection of the late Earl Cairns, will build a Tobin bronze cutter, which is to be called "Tobin," to meet Mr. James Gordon Bennett's new yacht, and in case she is successful he will challenge for the America's Cup in 1895. Tobin bronze seems to be the only correct material of which to build cup defenders, and its makers, the Ansonia Brass and Copper Company, should feel justly proud.

The Berlin Iron Bridge Company, of East Berlin, Conn., are putting up a new transfer station for the Washington and Georgetown Railroad Company, at Washington, D. C. The same company are putting up an iron and steel building seven stories high for James Pettit, of New York city. The Batopilas Mining Company, of Chihuahua, Mexico, have placed an order for four iron buildings and four bridges with the Berlin company. The buildings are to be shipped by steamer to Galveston, Texas, from there by rail to the interior of Mexico, where they must be carted a distance of 100 miles on a mule's back up into the mountains.

The Frisbie Elevator and Manufacturing Company, New Haven, Conn., report that their sales for the month of March far exceeded that of any one month since the existence of the company, and equal to any four ordinary months in the year. Among the many contracts secured within the past few weeks may be mentioned a large order for Frisbie clutch pulleys and cut-off couplings, patent pillow blocks, hangers, shafting, etc., for the New Haven Electric Light Company's new station; a 2,000 pound Champion safety freight elevator of their new friction pulley pattern for the E. S. Greeley & Company's new building at 5 and 7 Dey street, New York; a five ton freight elevator of the same pattern for the Safety Insulated Wire and Cable Company, West Twenty-eight street, N. Y.; a combined passenger and freight elevator for Messrs. Schneider & Herter, 141 West Broadway, N. Y.; a Champion freight elevator for the National Sugar Refining Company, of Yonkers, N. Y.; another of the same pattern for the Portland Cement Company, at Glens Falls, N. Y.; a No. 4 freight elevator for the Rhode Island Card Board Company, Pawtucket, R. I.; a No. 2 Champion safety freight elevator, friction pulley type, for Mr. Henry Reinhardt, Eighty-sixth street and Third avenue, New York, and last, but not least, one order for 148 Frisbie friction clutch pulleys from 17 to 90 inches in diameter. Judging from the large business now coming from electric light plants throughout the country, from Maine to California, it is evident that the many advantages that the Frisbie clutch pulleys and cut off couplings possess, are being appreciated.

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PROPOSALS FOR MISCELLANEOUS ARTICLES. Office of the Lighthouse Engineer, Third District, Tompkinsville, N. Y., April 28, 1894.—Sealed proposals will be received at this office until 12 o'clock M., Monday, the 14th day of May, 1894, for furnishing miscellaneous articles for the lighthouse establishment. The articles needed consist of 19 numbered lots, embracing, respectively, charcoal; building material; engineers' supplies; hardware, tools, etc.; iron and steel; belting; graphite paints, etc.; lumber; brick; plate glass; galvanized and Russia sheet iron, tin, solder, sheet zinc and iron wire; sheet brass and copper, bar copper, brass rod and tubing; composition, brass, and nickel castings; acids, iron castings; sheet-iron smoke-stacks for boilers; electro-plating supplies; shooks for oil supply boxes; and miscellaneous articles; all of which are enumerated in the specifications attached to the form of bid, which may be obtained on application to this office. Samples may be seen or information obtained at this office concerning any article not sufficiently described in the specifications. Bids will be received for one or more numbered lots complete. Envelopes containing proposals should be endorsed "Proposals for Miscellaneous Articles." The right is reserved to reject any or all bids, to strike out any item or items in the specifications, and to waive any defects. The right is also reserved to require the delivery under the contract of a greater or less quantity of any item mentioned in the specifications other than quantities therein specified. Bidders are invited to be present at the opening of proposals. D. P. HEAP, Major of Engineers, U. S. A., Engineer Third Lighthouse District.

SEALED PROPOSALS

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